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Patentanmeldung Nr. Patent application No. Demande de brevet n°

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Device having a first and second sound generating means and an input for a signal for stereo sound

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Device having a first and second sound generating means and an input for a signal for stereo sound

FIELD OF THE INVENTION

The invention relates to a device having a first and second sound generating means and an input for a stereo signal comprising a left and right sound signals.

DESCRIPTION OF PRIOR ART

Devices comprising two sound generating means are known and such devices are widely used.

Spatial localization of sound has always been considered as of paramount importance in audio reproduction devices. Contemporary sound reproduction devices are required to have at least stereo playback capabilities and for such facilities conventionally two or more loudspeakers are provided. This usually results in devices with external loudspeakers separated from each other by a considerable distance and the associated footprint and wiring issues. However, this requires a space with enough distances between the loudspeakers which is not always available and often requires also wiring. More compact devices would in many circumstances be preferred. However, although such more compact devices have been developed and sold, the stereo playback of more compact devices such as `ghettoblasters' is not perceived as true stereo playback because the loudspeakers are spaced very close to each other. Some stereo widening techniques such as Philips' Incredible Surround' are known and overcome to some extent such limitation. Such techniques typically, however, may reduce the sweet spot (i.e. the area in which a good or acceptable stereo sound is produced), which sometimes becomes impractically small since consumers typically do not sit exactly in front of such a sound device. Furthermore such techniques are usually complicated. Typically compact devices for producing stereo sound have the drawback that although they do provide stereo sound only in or near the sweet spot, i.e. the positions in which this is achieved is limited to usually a rather small area right in front of the device. For true stereo sound perception it is highly preferred that the stereo sound perception remains when a listener walks around or, when more than one listener are listening to the sound, all listeners are provided with substantially the same quality of sound. The stereo signal has a left and right sound signal. The denotations "left" and "right" are to be taken as to merely

indicate one of the usual sub-signals of a stereo (wherein "stereo signal" may be any multi-channel signal) the denotations are not to be taken, unless specifically otherwise described, as anything else but such a simple division of the stereo signal using common terms, and not an undue restriction. In a simple embodiment, however, "left" and "right" stand for the usual "left" and "right" stereo channels.

Thus there is a need for a device that is capable of giving a stereo sound sensation to the listener over a relatively large area while yet being a, preferably very, compact sound reproduction device.

SUMMARY OF THE INVENTION

The object of the invention is to provide a compact sound reproduction device capable of giving a stereo sound sensation over a relatively large area.

To this end, the device in accordance with a first aspect of the invention is characterized in that it comprises an interconnected first and second part comprising respectively a first and a second sound generating means, the first part being formed such as to couple sound waves generated by the first sound generating means into a surface when placed upon a surface, and wherein the device has means for sending a signal which is a composite of the left and right sound signals to the first sound generating means of the first part, and a signal which is a different composite of the left and right sound signals to the second sound generating means of the first part.

The invention is based on the following insights:

Stereo music typically has a left and a right channel (L, R). The inventors have realized that by forming the first part such that the sound waves are effectively coupled into a surface on which the first part may be placed, e.g. a table, said object on which the first part is placed will be excited and vibrate with the sound generated by the first part. The first signal, which is a composite of the left and right sound signal, is, due to largeness of the vibrating object, perceived as a "volume sound". Another signal, also a composite of the left and right sound signal, but a different one, is sent to the second part, which basically acts as a point source. Wherever the listener is seated around the table, the sound from both sources, however, sounds the same. The result is that the sound perception is the same all around the device. There is not one "sweet spot". The inventors have found that a surprisingly good stereo perception can be obtained. The signals send to the first and second part are different, since the inventors have found that certain sounds attribute more to the volume sound effect than others.

More in particular, for preferred embodiments the first signal, sent to the first part, and the second signal, sent to the second part, are in operation substantially orthogonal signals, i.e. when the first signal is expressed as S1=aL +bR, and the second signal as S2=cL + dR, where L and R are the left, respectively right sound signal, the product (ac+bd) is on average substantially zero, at least less than 0.1, preferably less than 0.05, wherein most preferably the absolute values of a and c are approximately (within twenty to ten percent) the same, as are the absolute values of b and d .

In a preferred embodiment the first signal is mainly comprised of a difference of the left and right stereo sound signals (L-R) and the second signal sent to the second part, the point source is mainly comprised of a sum signal of the left and right stereo sound (L+R). In another preferred embodiment the signals may be analyzed to find a dominant signal (aL + bR), and the device has means for sending a dominant signal and the residual signal. Most music comprises on the one hand signals that are present in both of the stereo signals, typically for instance a singer or a solo artist. The sound produced by the solo artist is usually the dominant signal, and usually the solo artist stands in the middle, i.e. the intensities for the sound produced by the solo artist are the same in the left and right sound signal. Summing the stereo signals (L+R) and sending the sum (L+R) to the second sound producing means will lead to the solo artist being heard as if present at the position of the second part, i.e. a localized source for the singer or solo artist is established. The sound produced by this localized source is perceived substantially the same around the source. The sounds that give stereo impression to the music are typically present at either the left or right signal or at least much more in one channel than in the other. Sending the difference signal (L-R) to the first sound generating means would in itself not necessarily give a sufficient stereo sound impression, since both the first part (L-R source) and second part (L+R source) would generate sound at a single point, where usually for a compact device these points are close to one another. This would lead to the same problems above described for existing devices. In the device in accordance with the invention, in operation, it is possible, via the first part to effectively couple this sound into a surface on which the first part may be placed, e.g. a table, whereby said object on which the first part is placed will be excited and vibrate with the sound generated by the first part. The result is that the table or other object co-vibrating with the second part forms a spatially extended source generating the difference signal (L-R). Wherever the listener is seated around the table, the sound from both sources sounds the same. The combination of a localized source for one composite signal, preferably the dominant signal, for instance the sum signal (the second part L+R) and a spatial source for

another composite signal, preferably the residual signal, for instance for the difference signal (L-R) (the first part in combination with a vibrating, excited, surface) produces a stereo sound impression all around. The electronics for the present device are very simple, the device itself may thus be very compact. Yet a stereo sound impression is achieved which does not require the listener to be positioned in a particular spot or area. Using a sum and a difference signal is a preferred embodiment.

The invention makes use of the possibility to vibrate a large rigid object, for example a table top, by means of a much smaller primary source, such that it produces a larger sound than the sound originating from the primary source if sufficient acoustical coupling is ensured. Depending on the properties of the object to be excited and the acoustical coupling, the sound intensity of the larger object is larger and richer than that of the primary source (the first sound generating means) alone, presumably because of the much larger surface area of the table when compared to the primary source. This phenomena is in this application also called co-vibration or co-excitation.

It is noted that within the concept of the invention, the device is made such that a table vibrate when the first part is positioned on a table or other co-vibrating object. To some extent such effects always occur. However, normally each loudspeaker box is made to minimize as much as possible such effect, in other words co-vibration is as much as possible counteracted or minimized. In conventional designs the loudspeakers do not or hardly make contact with the table, usually the loudspeakers are in fact hung in an enclosure which in fact comprises or functions as a good vibration damper. In the present invention, to the contrast, the effect of co-vibrating is an integral part of the invention. Measures are described herein below to distinguish devices in accordance with the invention, from those outside the scope.

The first part of the device and the first sound generating means are so arranged that, when the first part is positioned on a table top as defined in this application, the sound volume produced by said first part at 1 meter distance from the said first part is increased by at least 6 dB as compared to the same part when used in air. Simply picking up the first part will therefore distinguish those devices within and outside the scope of the present invention. In short the device is laid on a wooden (plywood) table top having a thickness of 18 mm and a size of 90*180 cm, more or less corresponding to a standard office table, and a force corresponding to a weight of 100 gram is applied to the device while laying flat on the table, with the display parallel to the table, and the increase in sound intensity is measured at a distance of 1 meter in respect of the same device when in air, i.e. laying on

wool. The 100 gram includes the force applied by the device itself. In many circumstances this will be approximately the weight of the first part itself.

The manner in which the increase in sound intensity is measured is defined in this application.

Preferably the first part comprises a coupling means. Using a coupling means, i.e. a means for enhancing mechanical coupling very substantial increases in sound intensity of the first sound generating means, above 15 dB, even above 20 dB are possible. Such means may e.g. be suction means or magnets, suction means will effectively increase the force with means the device sticks to the table (enhancing its apparent weight), magnets will enhance its apparent weight when put on a steel surface. Both may be present.

The mechanical coupler is preferably formed such that it extends slightly beyond the first means proper so that when the first means is positioned on the table or other flat surface the first means rests on the mechanical coupler. The mechanical coupler itself does not have much influence on the sound intensity of the device when held in the hand.

Due to excitation of the object upon which the first part is placed a much richer and better audible sound is obtained.

The standard test with which the increase can be measured is explained in the figure description. Basically the increase in sound volume is measured at a distance of 1 meter, while the device is placed, resting on a wooden table of 18 mm thickness, measuring 90*180 cm while the total weight of device plus additional pressure exceeds 100 grams.

In preferred embodiments the device is provided with a sound recording element and the device comprises a means to establish a comparison between a registered sound and an emitted sound signal and means to indicate that the device is in co-excitation with another object and to regulate the sound intensity of the first means in accordance. In advance it is not known on what surface the first means will be positioned. Thus the effective sound intensity may vary, depending on the table on which the first means is positioned. By providing a microphone, and a feed back of the actual sound intensity, some means of regulation the sound intensity in effect produced by the first means is possible.

In preferred embodiments the second sound producing means is positioned on a swivel, i.e. a means for changing the direction of the sound produced by the second sound generating means. Such a swivel (which within the framework of the invention comprises any means to change the position or direction of the second sound generating means vis-à-vis the first, while yet maintaining a physical connection) may e.g. be used advantageously to direct the sound in one general direction.

In another related aspect of the invention the device comprises an interconnected first and second part comprising respectively a first and a second sound generating means, the first part being formed such as to couple sound waves generated by the first sound generating means into an outer envelope of the first part, and wherein the device has means for sending a first signal which is a composite of the left and right sound signals to the first sound generating means of the first part, and a second signal which is a different composite of the left and right sound signals to the second sound generating means.

In further related aspect of the invention the device comprises an interconnected first and second part comprising respectively a first and a second sound generating means, the first part being formed such as to couple sound waves generated by the first sound generating means into an elongated element coupled to the first part, and wherein the device has means for sending a signal which is a composite of the left and right sound signals to the first sound generating means of the first part, and a signal which is a different composite of the left and right sound signals to the second sound generating means.

The inventors have realized that a similar advantage may be obtained by using either an outer envelope of the first part as a co-vibrating object, or an elongated (i.e. an object with a dimension larger than the dimension of the first part itself) element.

These and other objects of the invention will be apparent from and elucidated with reference to the examples described hereinafter.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings:

Fig. 1 illustrate schematically a device in accordance with the invention

Fig. 2 illustrates the basic concept of the invention.

Figs. 3A and 3B illustrate schematically further embodiments of a device in accordance with the invention.

Fig. 4 illustrates schematically yet a further embodiment of a device in accordance with the invention.

Fig. 5 illustrates a device in accordance with the invention including a sound co-vibration element.

Fig. 6 illustrates the experimental set-up for measuring sound enhancement by acoustical coupling.

Fig. 7 illustrate a further embodiment of a device in accordance with the invention.

Fig. 8 illustrates a further embodiment in accordance with the invention.

The figures are not drawn to scale. Generally, identical components are denoted by the same reference numerals in the figures.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

Figure 1 schematically shows a compact stereo device in accordance with the invention.

The stereo device comprises an input for an incoming stereo signal S comprising a left (L) and a right (R) signal, the device further comprises an interconnected first (1) and second part (3) comprising respectively a first (2) and a second (4) sound generating means. The first part 1 is formed such as to couple sound waves generated by the first sound generating means into a surface when placed upon a surface. Basically sound waves are in this example effectively coupled with the housing and via the housing with for instance a table top or directly into the table top. Normally sound generating means are positioned inside loudspeakers such that they are as much as possible decoupled with the housing and the outside world. In the first part the opposite effect is sought, a large coupling is present to the outer envelope, to an elongated element or to a surface upon which the first part is placed. The device has means 5 for sending a composite signal S2 (L+R) in this example comprising a sum signal of the first (L) and second (R) stereo signals to the second sound generating means (4) of the second part (2), and another, different composite signal S1 (L-R) in this example comprising a difference signal of incoming first (L) and second (R) stereo signals to the first sound generating means (2) of the first part (1). Preferably the composite signals are orthogonal signals, i.e. when the first signal S1=aL +bR and the second signal S2=cL +dR then ac + bd ≈0. Using a sum and difference signal is a simple embodiment. The device may have means to establish a dominant signal, and send it to the second part (the "point-source"), and send the residual signal (a signal orthogonal to the dominant signal to the first means (the "spatial source"). In simple designs the different composites S1, S2 of the signals may be the same throughout all frequencies. In more complex embodiment the values a, b, c and may differ for different frequency ranges. In an embodiment, for instance the first and second part may receive the same signal for a lower frequency range up to cut-off frequency e.g. up to 300 or 500 Hz, and orthogonal signals at all frequencies above the cut-off frequency.

The first sound generating means (2) of the first part (1) may be, and in preferred embodiments, is a piezo-element, which is so positioned that when the device is

placed on a surface the piezo element rests against the surface. In this manner vibrations are effectively coupled into the surface. A piezo element is a preferred element for the first part since piezo element due to their form and functions are well suited to couple sound waves into surface. The second sound generating means (4) of the second part (2) may be a squeeter. The means 5 may be attached to the first and second part forming a unit. In such embodiments the unit receives the signal S and the sum and the difference signal are generated in situ, i.e. in the unit. In other embodiment the means 5 is separate from the first and second part. For instance, there may be one central processing unit (such as a CD-player) and several sound units, wherein at the central processing unit a means 5 is provided for providing the signal, which are then wirelessly sent to the units.

Fig. 2 illustrates the basic concept of the invention in the first aspect. The invention is based on the insight that it is possible to vibrate a large rigid object, for example a table top 6, by means of a much smaller primary source (first sound generating means 2), such that it produces a larger sound than the sound originating from the primary source if sufficient acoustical coupling is ensured. Depending on the properties of the object to be excited and the acoustical coupling, the sound intensity of the larger object is larger and richer than that of the primary source (the first sound generating means) alone, presumably because of the much larger surface area of the table when compared to the primary source. Thus even lower frequency sound can be produced even though the excitation amplitude of the table is much smaller (a few nm) than that of the primary source itself (several microns to tens of microns). In order for this to be achieved a positive large enough acoustical coupling between the sound generating means and the larger object needs to be established. This phenomena is in this application also indicated by the words co-vibration and/or co-excitation. Fig. 2 illustrates schematically that the second sound generating means produce a sound which originates more or less from a single point, whereas due to the co-vibrating of the table top, illustrated by the vertical arrows, an extended sound source, illustrated by the arrows emanating from the element 6, is created.

Sending the sum (L+R), or in another preferred embodiment the dominant signal, to the second sound producing means (4) will lead to the solo artist being heard as if present at the position of the second part, i.e. a localized source for the singer or solo artist. The sound produced by this localized source is perceived substantially the same all around the source. The sounds that give stereo impression to the music are typically present at either the left or right signal or at least much more in one channel than in the other, or in the residual signal or in anti-phase or decorrelated. Sending the difference signal (L-R), or the

residual signal, to the first sound generating means (2) would in it self not necessarily give a sufficient stereo sound impression, since both the first part (L+R-source) and second part (L-R source) would generate sound at a single point, where usually for a compact device these points are close to one another. In the device in accordance with the invention the sound waves are, when positioned on a surface, effectively coupled into a surface on which the first part is placed, e.g. a table. The object on which the first part is placed will vibrate with the sound generated by the first part. The result is that the table or another object itself forms a spatially extended source, as illustrated in figure 2 reproducing the difference signal (L-R). Wherever the listener is seated around the table or object in general, the sound from both sources sounds the same. The combination of a localized source for the sum signal (the second part) and a spatial source for the difference signal (the first part in combination with a vibrating surface) produces a stereo sound impression. This stereo sound impression is substantially the same around the co-vibrating object. The electronics are very simple, as is the device, the device itself may thus be very compact. Yet a stereo sound impression is achieved which does not require the listener to be positioned in a particular spot. It is remarked that where mention is made of "the sum" and the "difference" signal, such is meant to express that the signal sent is mainly comprised of the sum and-or difference signal.

Figs. 3A and 3B illustrate a further embodiment of a device in accordance with the invention. The device comprises a coupling means 7, 8 for coupling the first part of the device to a surface. Such coupler may for instance be a suction device 7. Some suction force will increase the coupling between the device and the surface. The coupling means may also be in the form of magnets 8. Provision of such magnets will increase the coupling upon a steel surface. The coupling means may combine both function for instance when suction devices with magnets enclosed are used.

Fig. 4 illustrates a further embodiment. In this embodiment the first and second part are interconnected in such manner that the first part may be moved and oriented in respect of the second part. Some directionally in the second sound source may thereby be imparted.

Fig.5 illustrates another aspect of the invention in which the device itself comprises a co-vibrating element 51. In embodiments such as in the previous figures the unit of first and second sound generating means will be placed on a table to produce stereo sound. In the embodiment of figure 5 the device itself comprises the vibrating means. An example of such a means is a table 51 which comprises a built in first and second part. This may be in the form of a unit comprising a first and second part, and an extended element, wherein the

extended element and the unit comprise fastening means to mechanically fasten the unit and the extended element. In preferred embodiment the fastening means are reversible, i.e. the unit may be decoupled from the extended element. This would allow to decouple the unit and place it on another element or e.g. a table. A further example of a device similar to the one shown in fig. 5 would be an overhead set, wherein the extended element would be part of or parallel to the ceiling. The sound would then come from above. The advantages of a device that has a co-vibrating element built-in (be it the outer envelope of the first part or an elongated element to which the first part is coupled) is that the coupling is known.

Figure 6 schematically indicates the manner in which the sound increase is measurable. The device 1 is positioned on a table 51 in the proper orientation and if it has a coupling means 7, 8 with the coupling means on the table, and if the device has a suction cup, with suction action.

The sound level at 1 m distance is measured at a frequency of 1 and 2 kHz, while the first part receives a signal at mid-range of the dynamical range of the first part. The device is removed from the table and placed on a woolen cloth or suspended in air. The sound level is again measured using of course the same signal and the same distance and orientation of the sound recording means and device. If the sound level increase for said frequencies is more than 6 dB, the device falls within the scope of the claim, if not, outside. Preferably the increase is at least 15 dB, more preferably at least 20 dB. The table has a wooden (plywood) table top of 90*180 cm with a thickness of 18 mm. This corresponds more or less to a standard table top in offices.

In the standard test a table having a plywood table top of 18 mm and a size of 90*180 cm is used. However, this is merely for the purpose of establishing a bench mark. Experiments have shown that when this is the case very similar results are obtained e.g. if a table of 14 mm plywood and size 160*80 cm was used or a steel table top and size 100*200 mm.

The standard of the plywood table with the specified measures is used to establish a frame of reference, the values for other types of table top are grosso mode similar. It is remarked that within the concept of the invention, the device is made such that a table vibrates when the first part is positioned on a table or other co-vibrating object. To some extent such effects always occur. However, normally each loudspeaker box is made to minimize as much as possible such effect, in other words co-vibration is as much as possible counteracted or minimized. In conventional designs the loudspeakers do not or hardly make contact with the table, usually the loudspeakers are hung in an enclosure which in fact

comprises or functions as a very good vibration damper. In the present invention, to the contrast, the effect of co-vibration is an integral part of the invention. The above described measurement, easy to perform for any person skilled in the art clearly distinguish devices in accordance with the invention, from those outside the scope. For a device in which an elongated element is built in (as in figure 5), the contribution to the sound of the vibrating element is easily measurable by measuring the sound produced by the device when a signal is send to the first part, and then measuring again while clamping down the element (so that it cannot vibrate, a heavy weight could for instance be put on the element) and then dividing the two measurement by dividing the intensities. If it is more than 6 dB, preferably more than 15 dB, the device is as device in accordance with the invention. When the outer envelop of the first part forms the co-vibrating element a similar test may be performed, in which a signal is send to the first part in normal operation and mid-range, the sound intensities are measured, thereafter the outer envelope is clamped down such that it cannot vibrate, and the sound intensities are measured again, and the measured sound intensities are divided.

Figure 7 illustrates a preferred embodiment of the invention. The co-vibrating surface may change the frequency distribution of the sound, since certain frequencies may be more amplified than others. Figure 7 illustrates a device comprising a sound recording means 71, which records the sound generated. This sound is in comparator C compared with the original sound (slightly delayed in time, to take care of the time difference). The measured difference in intensity and e.g. in frequency distribution of intensity, is fed back to amplifier A to change the signal to the sound generating means such that the end result is that the recorded sound corresponds, within measuring accuracy of course, to the original signal. It is to be noted that in that case the signal fed to first sound generating means will be equivalent to L-R, but not exactly the same, thus illustrating an example of the circumstances, as already mentioned above that there where mention is made of a sum or difference of a signal being sent to the first (second) sound generating means such is meant to indicate the general content of the signal, but should not be so restrictively be interpreted as to be purely the sum or difference signal.

The first part and second part are in the shown embodiments interconnected. In preferred embodiment this means that they are physically interconnected, the two parts form an integral unit. This does not mean however, that the unit may not comprise means to decouple the first and second part. In embodiments this may be advantageous, e.g. because this would enable to provide the second means above a table and the first means on a table.

However the two parts would still form a unit in the sense that they are interconnectable to form one unit, and that the signals are coupled.

Fig. 8 illustrates an embodiment in accordance with another aspect of the invention in which the first part comprises a first sound generating means which is coupled to an outer envelope (housing) 81 of the first part. The outer envelope functions as a spatial source.

It will be clear that within the framework of the invention many variations are possible. It will be appreciated by persons skilled in the art that the present invention is not limited by what has been particularly shown and described hereinabove. The invention resides in each and every novel characteristic feature and each and every combination of characteristic features. Reference numerals in the claims do not limit their protective scope. Use of the verb "to comprise" and its conjugations does not exclude the presence of elements other than those stated in the claims. Use of the article "a" or "an" preceding an element does not exclude the presence of a plurality of such elements.

With reference of the Claims, it is to be noted that various characteristic features defined in the set of Claims may occur in combination.

CLAIMS:

1. A device having a first (2) and second sound (4) generating means and an input for a stereo signal (S) comprising a left (L) and right (R) sound signals (L, R), wherein the device comprises an interconnected first (1) and second (3) part comprising respectively a first (2) and a second (4) sound generating means, the first part (1) being formed such as to couple sound waves generated by the first sound generating means (2) into a surface (6) when placed upon a surface (6), and wherein the device has means (5) for sending a first signal (S1) which is a composite of the left (L) and right (R) sound signals to the first sound generating means (2) of the first part (1), and a second signal (S2) which is a different composite of the left (L) and right (R) sound signals to the second sound generating means (4).

2. A device having a first (2) and second sound (4) generating means and an input for a signal (S) comprising a left (L) and right (R) sound signals (L, R), wherein the device comprises an interconnected first (1) and second (3) part comprising respectively the first (2) and the second sound (4) generating means, the first part (1) being arranged to couple sound waves generated by the first sound generating means (2) into an outer envelope (81) of the first part, and wherein the device has means (5) for sending a first signal (S1) which is a composite of the left (L) and right (R) sound signals to the first sound generating means (2) of the first part (1), and a second signal (S2) which is a different composite of the left (L) and right (R) sound signals to the second sound generating means (4) of the second part (3).

3. A device having a first (2) and second sound (4) generating means and an input for a signal (S) comprising a left (L) and right (R) sound signals (L, R), wherein the device comprises an interconnected first (1) and second (3) part comprising respectively the first (2) and the second sound (4) generating means, the first part being formed such as to couple sound waves generated by the first sound generating means (2) into an elongated element (51) coupled to the first part (1), and wherein the device has means (5) for sending a first signal (S1) which is a composite of the left (L) and right (R) sound signals to the first sound generating means (2) of the first part (1), and a second signal (S2) which is a different

composite of the left (L) and right (R) sound signals to the second sound generating means (4) of the second part (3).

4. Device as claimed in claim 1, 2 or 3, wherein the means for sending (5) are arranged such that the first and second signal are substantially orthogonal signals.

5. Device as claimed in claim 4, wherein the means for sending (5) are arranged such that the first signal (S1) comprises a difference signal of left and stereo signals (S1=L-R) and the second signal (S2) comprises a sum signal of the left and right stereo signals (S2=L+R).

6. A device as claimed in claim 1, wherein the first part comprises a coupling means (7, 8).

7. A device as claimed in claim 6, wherein the coupling means comprises a suction element (7).

8. A device as claimed in claim 6, wherein the coupling means comprises a magnet (8).

9. A device as claimed in claim 3, wherein the first part and the elongated element (51) are coupled be reversible coupling means.

10. A device as claimed in claim 1, 2 or 3, wherein the first sound generating means comprises a piezo-element.

ABSTRACT:

A sound device has a first (2) and second sound (4) generating means and an input for a stereo signal (S) comprising a left (L) and right (R) sound signals. The device comprises an interconnected first (1) and second (3) part comprising respectively a first (2) and a second (4) sound generating means, the first part (1) as formed such as to couple sound waves generated by the first sound generating means (2) into a surface (6) when placed upon a surface (6), and the device has means (5) for sending a first signal (S1) which is a composite of the left (L) and right (R) sound signals to the first sound generating means (2) of the first part (1), and a second signal (S2) which is a different composite of the left (L) and right (R) sound signals to the second sound generating means (4).

Figure 6

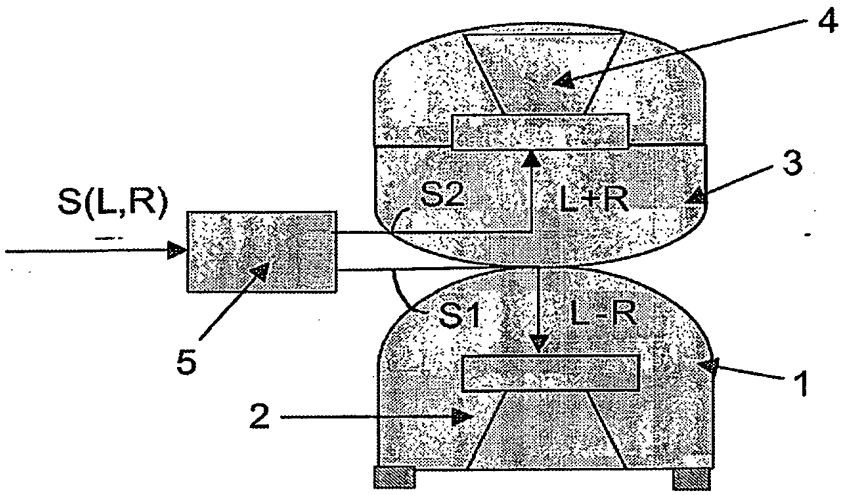

FIG.1

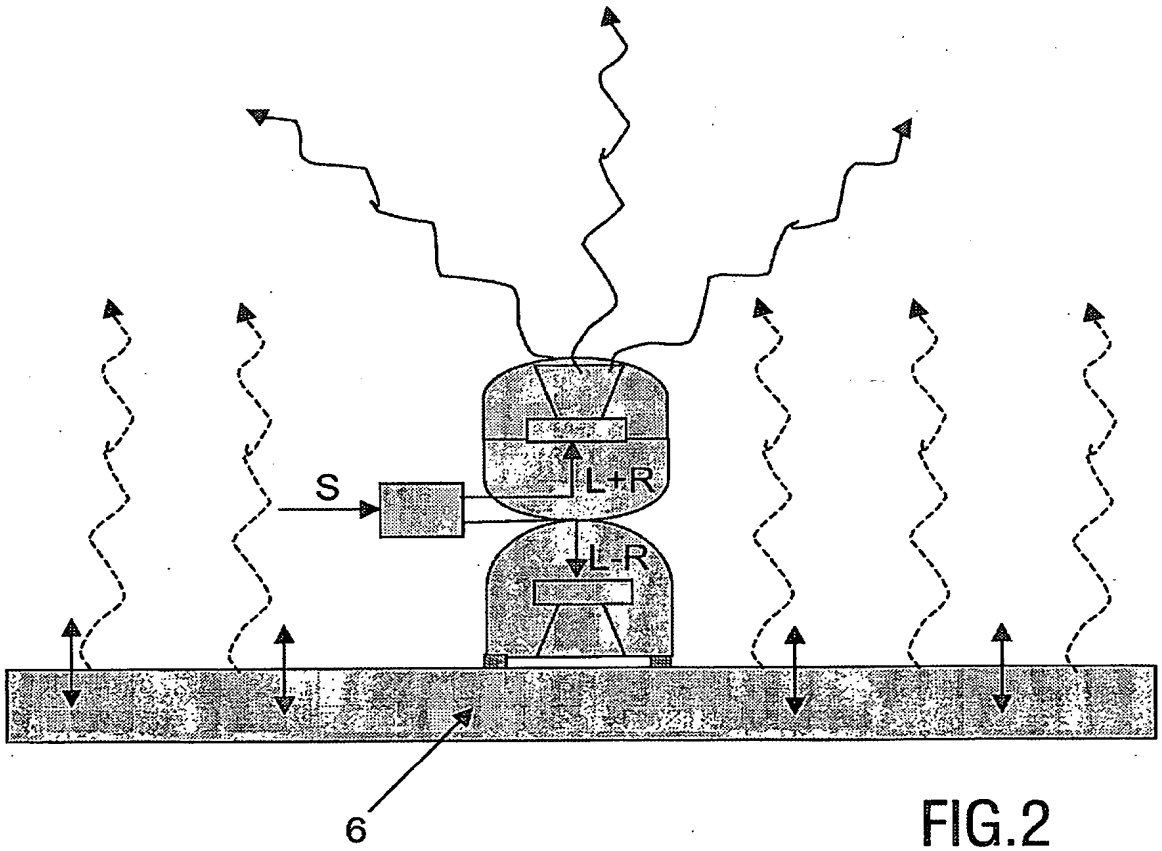

FIG.2

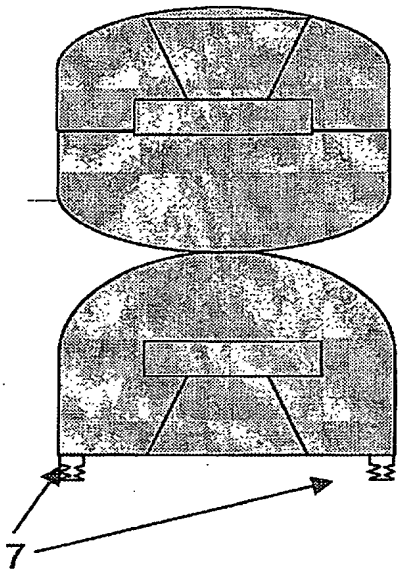

FIG.3A

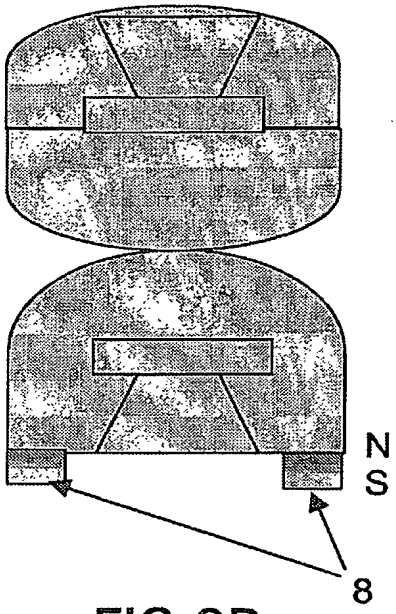

FIG.3B

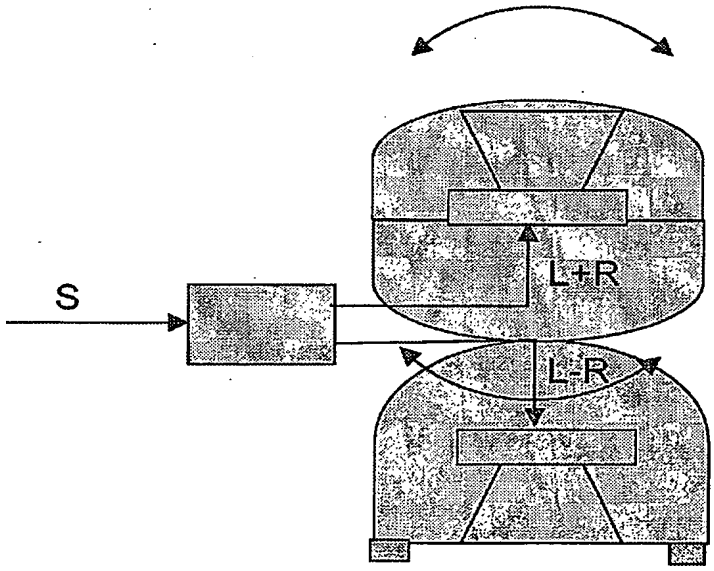

FIG.4

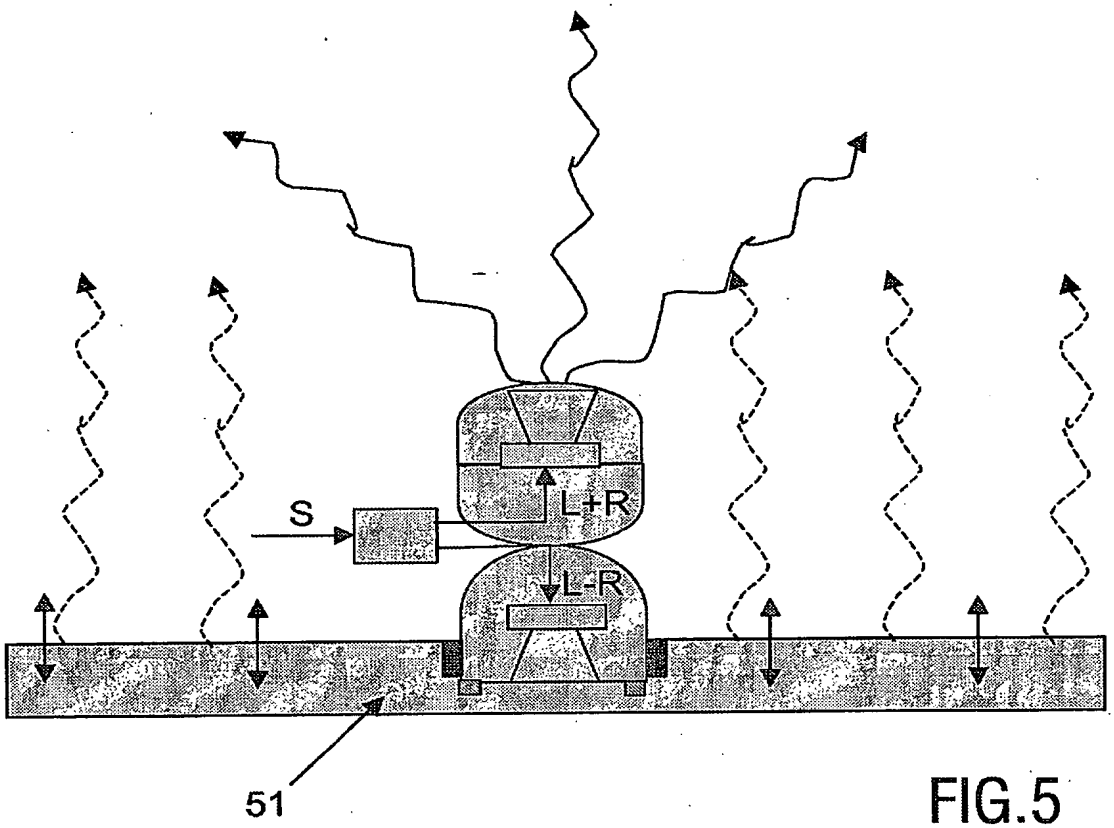

FIG.5

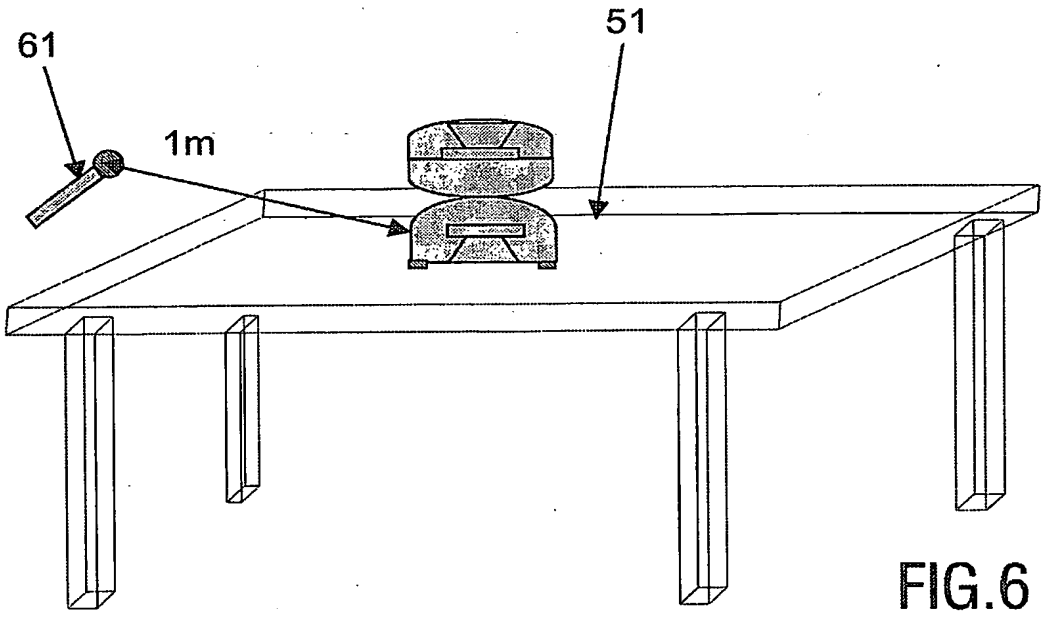

FIG.6

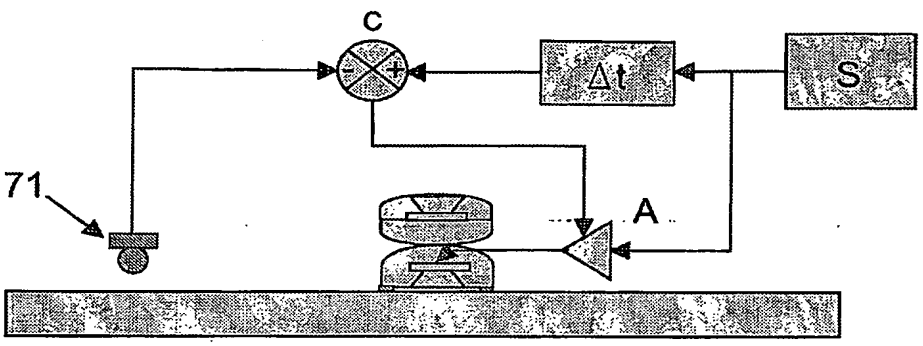

FIG.7

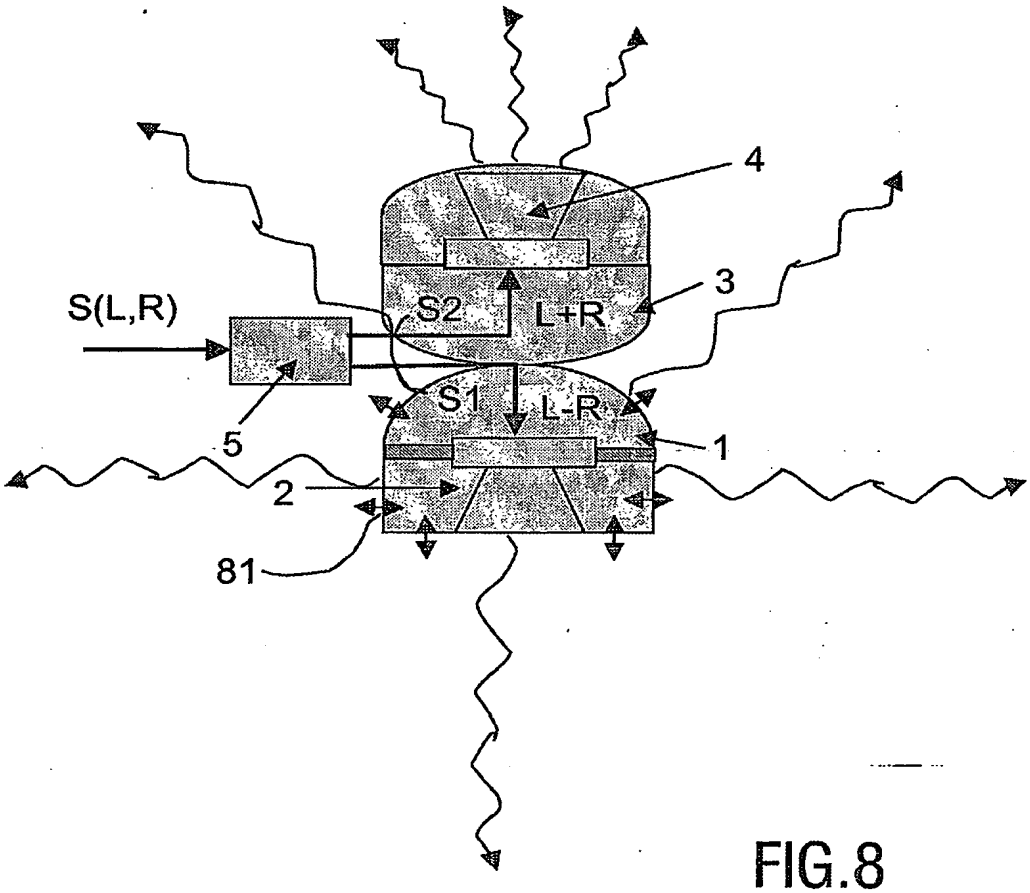

FIG.8